

Claims

1. A water-based catalyst ink comprising:
 - (a) an electrocatalyst in an amount of 5 to 75 wt.% based on the weight of the ink;
 - 5 (b) an ionomer solution in an amount of 10 to 75 wt.% based on the weight of the ink;
 - (c) water in an amount of 10 to 75 wt.% based on the weight of the ink;
 - (d) an organic solvent in an amount of 0 to 50 wt.% based on the weight of the ink; and
 - 10 (e) a surfactant with a vapor pressure at ambient temperature in the range of 1 to 600 Pascal, in an amount of 0.1 to 20 wt.% based on the weight of the ink.
2. A water-based catalyst ink according to claim 1, wherein the vapor pressure of
15 the surfactant at ambient temperature is between 100 and 500 Pa.
3. A water-based catalyst ink according to claim 2, wherein the surfactant is selected from the group consisting of fluorinated wetting agents, tetramethyl-decyn-diol based wetting agents, soya-lecithin based wetting agents, phospho-amino-lipoides and mixtures thereof.
- 20 4. A water-based ink according to claim 3, wherein the concentration of the surfactant is between 0.1 to 10 wt.% relative to the total weight of the catalyst ink.
5. A process for manufacturing a catalyst-coated substrate that comprises a hydrophobic surface and deposited thereon a catalyst layer, said process comprises the steps of:
25 (a) providing a substrate with a hydrophobic surface;

- (b) coating said hydrophobic surface of the substrate with a catalyst ink, wherein said catalyst ink is comprised of an electrocatalyst, an ionomer, a solvent and a surfactant; and
- (c) drying the resultant catalyst-coated substrate;

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wherein the surfactant has a vapor pressure at ambient temperature in the range of 1 to 600 Pa.

- 6. A process for manufacturing a gas diffusion electrode that comprises a hydrophobic gas diffusion layer and deposited thereon a catalyst layer, said process comprises the step of:
 - (a) applying a catalyst ink to a gas diffusion electrode, wherein said catalyst ink is comprised of an electrocatalyst, an ionomer, and a solvent, wherein the surfactant has a vapor pressure at ambient temperature in the range of 1 to 600 Pa; and
 - (b) drying the gas diffusion electrode.

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- 7. The process according to claim 6, wherein prior to applying the catalyst layer, the gas diffusion electrode is first coated with a microlayer and then dried and calcined.

- 8. The process according to claim 5, wherein the surfactant of the water-based catalyst ink is removed at a drying temperature in the range of 50 to 150°C.

- 9. The process according to claim 7, wherein the gas diffusion electrode is calcined at a temperature between 200 and 400°C.

- 10. A method of using the catalyst-coated substrate manufactured according to claim 5, said method comprising incorporating said catalyst-coated substrate into a membrane-electrode-assembly.

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- 11. A method of using of the gas diffusion electrode layer manufactured according to claim 6, said method comprising incorporating said gas diffusion electrode into a membrane-electrode-assembly.

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